

The Largest Infrastructure Project in the Western Hemisphere

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On Thursday, January 18, 2001, 49 men and women drawn from different sectors of the concrete industry assembled at Shaft 19B of NYC Water Tunnel #3 for a unique opportunity to take a guided tour of Stage 2 of the Queens Tunnel which is nearing completion. Described as the largest infrastructure project in the Western Hemisphere, NYC Water Tunnel #3 is being built in four distinct stages, to augment and improve the water delivery system for New York City.

The Stage 1 of Tunnel #3, begun in 1970 and operational in July 1998, has already helped to improve the reliability of the City's drinking water distribution system. Stage 2 of Tunnel No. 3 currently under construction includes two segments and is scheduled to be completed in 2008. The first segment of Stage 2, which is in Brooklyn and Queens, will improve service to Staten Island, Brooklyn and Queens.

This phase will be followed by the construction of the Manhattan segment of Stage 2. Eventually, Stage 3, will extend from the Kensico Reservoir in Westchester County to the Van Cortlandt Park Valve Chamber complex in the Bronx and Stage 4 will deliver water to the eastern parts of the Bronx and Queens.

When finished in 2020, Tunnel No. 3 will create a more flexible means of supplying

drinking water to the entire City and will provide delivery alternatives in the event of disruption in any of the older Tunnels #1 and #2.

It will also permit NYCDEP to drain, examine and rehabilitate as needed City Tunnels #1 and #2. City Tunnel #3 is thus seen as a modular project, as each of the four stages builds onto the structure in place adding new and vital aspects to the total water system. Due to its sheer immensity and complexity City Tunnel #3 has been described as the eighth wonder of the world in the making. Such visits to the completed segments of the City Tunnel #3 are indeed few and far between; you will seldom have such an opportunity to be there.

Concrete in the Queens Tunnel

The Queens Tunnel (Contract 542B) consisted of excavating a tunnel $-654 \pm$ to $-762 \pm$ feet below the ground surface, 20 feet in diameter and over 5 miles long, by the TBM (Tunnel Boring Machine) method, and placing 100,000 cubic yards of strong, dense and watertight concrete lining 18 inch thick.

Laboratory trial batches were run to achieve several goals. The laboratory procedures took into consideration the requirements for workability, consistency, pumpability, handling and placing, shrinkage, times of set, behavioral and compressive strength (f_c' and f_{cr}) characteristics.

Concrete arrived at the shaft site via transit mix trucks and

was dropped down hundreds of feet to the tunnel invert through a 12 in. droppipe and filled a waiting rail-mounted agitator car below. Each train consisted of a locomotive and two or three agitator cars. Four trains were utilized to transport concrete in the tunnel, the five mile stretch to the heading, using two intermediate switches along the tunnel alignment. Concrete was remixed at the heading and pumped into the forms.

A high level of quality control for assurance of concrete quality and uniformity was maintained throughout by the DEP Division of Material Assurance at all transfer and control points. The basic objective of the Quality Assurance program was to verify the quality performance of materials used to specification.

The Field Trip

The men and women who visited the Queens Tunnel did so in three separate groups. Each group, before it was allowed to go down in the tunnel, was appropriately briefed and familiarized with the NYC water supply distribution system and concrete requirements. After the briefing, the participants were taken into "custody." They signed the required vaguely ominous document relinquishing all rights, titles and claims to all others for any damage, loss, liability or injury sustained during the trip.

They were hurtled down the shaft at one fell swoop into the dark, hidden subterranean world of sandhogs to quickly witness the culmination of hundreds of

concrete construction practices – the concrete lining of the Queens Tunnel. After spending 15 minutes or so in the tunnel, the participants were brought back to the surface, their accustomed sur-

roundings, before claustrophobia could discompose somebody. The tour, which began at 10 am, ran well past 12 noon.

“Oh, sure one of the best and scariest experiences of my

life” – one audacious participant volunteered his feelings this way. The chill and the surprise and the pride radiated from each and every attendee. ■

